

## REMARKS

Upon entry of the present amendment, claims 1-24 are pending in the application.

Claims 1 and 21 have been amended and add no new matter as support for amended claims 1 and 21 can be found in paragraph [0024] of Applicants' specification.

Claims 7 and 24 have been amended and add no new matter as support for amended claims 7 and 24 can be found in paragraph [0038] of Applicants' specification.

Claim 8 has been cancelled.

Claims 9-10 and 16 have been amended and add no new matter. Support for amended claims 9-10 can be found in paragraph [0026] of Applicants' specification.

Claim 23 has been amended to correct a typographical error.

Upon entry of the present amendment, claims 1-7 and 9-24 are pending in the application.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

**1. Rejection of claim 10 under 35 U.S.C. §112, first paragraph.**

Claim 10 stands rejected under 35 U.S.C. §112.

Claim 10 has been amended to enable one skilled in the art to make and/or use the invention. In particular, claim 10, has been amended to recite the language of paragraph [0026], lines 1 and 2, i.e., "one or more metals". It is respectfully submitted that the instant amendment renders the rejection moot.

Reconsideration and removal of the rejection is respectfully requested.

**2. Rejection of claims 7, 8, 10, 16, 17 and 24 under 35 U.S.C. §112, second paragraph.**

Claims 7, 8, 10, 16, 17 and 24 stand rejected under 35 U.S.C. §112.

Claims 7, 8, 16, and 24 have been amended for clarity and to more particularly point out and distinctly claim the invention.

Claim 10 has been amended to provide the proper antecedent basis for the limitations of the claim.

Claim 17 has been amended in accordance with the express language of paragraph [0026].

Reconsideration and removal of the rejection is respectfully requested.

3. Rejection of claims 1-3 and 21 under 35 U.S.C. §103(a) as being unpatentable over Becker et al., US 2002/0006368, hereafter "Becker" or "368" in view of Zhou, US 6,500,969, hereafter "Zhou" or "969."

Claims 1-3 and 21 are rejected as obvious over the combination of Becker in view of Zhou.

The outstanding office action acknowledges that Becker fails to teach a plurality of catalysts as being nanoparticles as required by Applicants' amended independent claims 1 and 21. In the outstanding office action, Zhou is used to rectify the deficiencies of Becker. In particular, the outstanding office action states:

Zhou also discloses an oxidation process (as does Becker) and the type of catalyst used in said oxidation process.

Zhou teaches nanoparticles being utilized as the catalyst in an oxidation reaction in order to ensure high activity and selectivity of desired oxidation products (col. 5 lines 34-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the nanoparticles of Zhou in the fluidized bed oxidation reactor of Becker in order to ensure high activity and selectivity of the desired oxidation products.

*(Office Action of 3-23-07, page 5).*

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

For example, Applicants respectfully submit that Becker fails to establish a prima facie case of obviousness with respect to the invention of amended independent claims 1 and 21 because Becker fails to teach or suggest all of Applicants' claim limitations. More specifically, as the outstanding office action acknowledges, Becker fails to teach that the plurality of catalysts must be nanoparticles. To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 USPQ 580 (C.C.P.A. 1974); MPEP 1243.03.

Zhou fails to rectify the deficiencies of Becker. Indeed, the combination or modification of Becker with Zhou fails to teach or suggest all the limitations of Applicants' amended independent claims 1 and 21.

First, Applicants respectfully submit that Zhou fails to establish a *prima facie* case of obviousness with respect to the invention of amended independent claims 1 and 21 because Zhou fails to teach or suggest all of Applicants' independent claim limitations. More specifically, Zhou fails to teach or disclose catalyst nanoparticles having an average particle diameter of about 15 nm to about 25 nm.

Zhou teaches a process for producing organic chemicals by selective oxidation ('969, col. 1, lines 12-13). Zhou accomplishes this goal by disclosing a chemical oxidation process based on hydrogen peroxide, wherein the hydrogen peroxide is the oxidizing agent and generated by a noble metal catalyzed reaction of hydrogen and oxygen, and further wherein the noble metal catalysts are nanoparticles ('969, col. 2, lines 26-27, 40-42 and col. 3, lines 60-64). Although Zhou teaches catalyst nanoparticles, it is completely silent as to requiring nanoparticles of a specific size. Nothing in Zhou teaches or suggests catalyst nanoparticles having an average particle diameter of about 15nm to about 25nm. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 USPQ 580 (C.C.P.A. 1974); MPEP 1243.03.

Second, Applicants respectfully submit that Zhou fails to render Applicants' invention obvious because it performs a step of Applicants' claimed process for a different purpose. More specifically, Zhou teaches using the noble metal catalyst nanoparticles to convert hydrogen and oxygen into hydrogen peroxide and not in the oxidation reaction as required by Applicants' invention. Hydrogen peroxide is the oxidizing agent of Zhou's process. The hydrogen peroxide may be produced *in situ* or in the first stage of a two-stage process, wherein oxidation of an organic chemical feedstock is the second stage ('969, col. 4, lines 41-67 and col. 5, lines 1-20). In both the *in situ* or two-stage mode of the process, the oxidation of the organic chemical feedstock may or may not be catalyzed by a second catalyst comprising an oxidation catalyst selective for organic chemicals ('969, col. 4, lines 51-54 and col.7, lines 28-30). In Zhou, catalyst nanoparticles are not taught to catalyze the oxidation of the organic

chemicals ('969, col. 7, lines 35-55). The primary attribute of the catalyst nanoparticles in Zhou are their "capability to catalyze the direct formation of hydrogen peroxide from hydrogen and oxygen feedstreams with high selectivity, even at low, safe hydrogen concentrations." ('969, col. 6, lines 39-43).

In contrast, Applicants' invention requires that the catalyst nanoparticles be employed in an oxidation reaction to efficiently decontaminate gases in a fluidized bed reactor system. A reference that performs a step of a claimed process for a different purpose and does not recognize the problem solved in Applicants' process does not render the process obvious. *Ex parte Wisdom et al.*, 184 U.S.P.Q. 822 (P.O.B.A. 1973).

Third, the Zhou reference teaches away from using from the oxidizing agents disclosed in Becker and the two references cannot be combined. Thus, fourthly, the cited combination of references fails to provide any motivation to do what Applicants have done. Becker provides that suitable oxidizing agents include air, oxygen-enriched air and oxygen gas with minor amounts of impurities such as nitrogen, carbon dioxide, and argon ('368, [0024]). In contrast, Zhou teaches away from the above mentioned oxidizing agents stating that such oxidizing agents are expensive, dangerous, and suffer from product selectivity problems ( '969, col. 1, lines 43-59). As an attractive alternative, Zhou teaches the use of peroxide compounds to provide the reactive oxygen needed for oxidative transformations ('969, col. 1, lines 60-63). References that teach away from each other cannot be combined and must fail to provide any motivation to do what Applicants have done.

Accordingly, (1) the cited combination fails to provide all of the required claim limitations, i.e., catalyst nanoparticles having an average particle diameter of about 15 nm to about 25 nm; (2) the Zhou reference performs a step of a claimed process for a different purpose and does not recognize the problem solved in Applicants' process; (3) the cited references teach away from each other and from Applicants' claimed invention; and (4) the cited combination of references fails to provide a motivation to do what Applicants have done, i.e. provide a fluidized bed reactor employing catalyst nanoparticles having an average particle diameter of about 15nm to about 25nm.

Applicants therefore respectfully submit that the cited combination of Becker and Zhou fails to provide a prima facie case of obviousness.

Reconsideration and removal of the obviousness rejection with respect to amended independent claims 1 and 21 is respectfully requested in view of the foregoing amendments and remarks. Dependent claims 2 and 3 are likewise submitted to nonobvious as these claims incorporate all of the limitations of independent claims 1 and 21.

4. Rejection of claims 4, 5, 7, 8, and 22-24 under 35 U.S.C. §103(a) as being unpatentable over Becker et al., US 2002/0006368, hereafter "Becker" or "368" in view of Zhou, US 6,500,969, hereafter "Zhou" or "969" as applied to claim 3 above, and further in view of Alford et al. US 6,887,291, hereafter "Alford" or "291."

Claims 4, 5, 7, 8, and 22-24 stand rejected as obvious over the combination of Becker in view of Zhou and in further view of Alford.

The outstanding office action acknowledges that Becker, as modified by Zhou, fails to disclose (1) a second input for introducing a backpressure pulse of gaseous material; (2) a gas permeable separation device in communication with both a port and the second input, wherein the exit of gas from a hollow interior region through the gas permeable separation device causes catalyst nanoparticles to collect upon the gas permeable separation device and the entrance of the backpressure pulse into the hollow interior region displaces collected catalyst nanoparticles; and (3) synchronizing the introduction of at least one of the group consisting of backpressure pulse, contaminated gas, or fluidizing material. Alford is relied upon to rectify the deficiencies of Becker as modified by Zhou. In particular, the office action states:

Alford also discloses a filter device for removing nanoparticles from gas streams using a gas permeable separating device (Fig. 1(2), see Abstract).

Alford teaches a second input (5) for introducing a backpressure pulse (pulse jet) of gaseous material into a hollow interior region (10) (col. 7 lines 59-67) in order to clean a filter (col. 7 lines 43-55).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the backpressure pulse input of Alford with the fluidized bed oxidation reactor with nanoparticles of the modified Becker in order to clean the filter that is used to separate the nanoparticles from the gas stream with the second input...

Alford teaches a gas permeable separation device (filter, 2) in communication with a hollow interior region (10) and the second input (5) and the entrance for introducing a backpressure pulse (pulse jet) into the hollow interior region (10) displacing collected catalyst nanoparticles (col. 7 lines 43-55). Alford teaches this in order to allow catalyst nanoparticles to be collected by said gas permeable separation device (filter) and to clean said gas permeable separation device of said catalyst nanoparticles (col. 7 lines 35-67).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the gas permeable separation device (in communication with the second input) and the entrance of the backpressure pulse into the hollow interior region to displace the collected nanoparticles of Alford, with the fluidized bed oxidation reactor of the modified Becker in order to allow catalyst nanoparticles to be collected by said gas permeable separation device and to clean said gas permeable separation device of said catalyst nanoparticles...

Alford teaches the introduction of the backpressure pulses to be synchronized with the rise in pressure in order to clean the filter before vessel pressure becomes too high (col. 6 lines 2-5). Alford also teaches that the backpressure pulses will be alternating on and off during the operation to create gas pulses and form a shockwave that vibrates and dislodges the material collected on the filter (col. 8 lines 1-6).

*(Office Action of 3/23/07).*

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks for Section 3 are incorporated herein by reference. As merely cited for disclosing 1) a second input for introducing a backpressure pulse of gaseous material; (2) a gas permeable separation device in communication with both a port and the second input, wherein the exit of gas from a hollow interior region through the gas permeable separation device causes catalyst nanoparticles to collect upon the gas permeable separation device and the entrance of the backpressure pulse into the hollow interior region displaces collected catalyst nanoparticles; and (3) synchronizing the introduction of at least one of the group consisting of backpressure pulse, contaminated gas, or fluidizing material, nothing in Alford rectifies the deficiencies of Becker and Zhou, as discussed above with respect to independent claims 1 and 21.

Since claims 4, 5, 7, and 22-24 respectively depend from independent claims 1 and 21, they necessarily incorporate all of the limitations thereof. As a result, it is

submitted that these dependent claims are likewise nonobvious for the reasons discussed above in Section 3.

Moreover, Alford fails to teach a device for synchronizing the function of the second input for introducing a backpressure pulse of gaseous material into the hollow interior region to function with at least one of the group comprising the first input for introducing a contaminated gas into the hollow interior region, the fluidizing input for introducing a fluidizing material into the hollow interior region and combinations thereof, wherein the device for synchronizing prevents the simultaneous introduction of at least one of the group comprising contaminated gas, fluidizing material, and combinations thereof with a backpressure pulse of gaseous material into the hollow interior region.

Alford teaches filter devices and methods for collection of carbon nanomaterials produced in gas phase reactors ('291, Abstract). Alford accomplishes this goal by disclosing filters cleaned by a reverse flow of gas pulses to said filter ('291, Abstract). The gas pulses "may be activated periodically at selected intervals during reactor operation or may be activated responsive to a system parameter such as reaching a maximum pressure within the reactor." ('291, col. 6, lines 2-5).

Although Alford discloses periodic activation of gas pulses, it is completely silent as to a device that synchronizes the introduction of the gas pulse with the introduction of one or more other gases into the hollow interior region. Nothing in Alford teaches or suggests introducing the back pressure gas pulse back into the hollow interior region, nor a device that synchronizes the introduction of the gas pulse with the introduction of one or more other gases into the hollow interior region.

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 USPQ 580 (C.C.P.A. 1974); MPEP 1243.03. Since Alford fails to disclose even these additional requirements of the inventions of these dependent claims, reconsideration and removal of the rejection is respectfully requested.

5. Rejection of claims 6 and 14 under 35 U.S.C. §103(a) as being unpatentable over Becker et al., US 2002/0006368, hereafter "Becker" or "368" in view of Zhou, US 6,500,969, hereafter "Zhou" or "969" as applied to claims 1 and 11, and further in view of Goswami, US 5,933,702, hereafter "Goswami" or "702."

Claims 6 and 14 stand rejected as obvious over the combination of Becker in view of Zhou and in further view of Goswami.

The outstanding office action acknowledges that Becker, as modified by Zhou, fails to expressly teach a humidifier in communication with the first input. Goswami is relied upon to rectify this deficiency of Becker as modified by Zhou. In particular, the outstanding office action states:

Goswami also discloses a photocatalytic/oxidation reactor for reacting a gas to remove contaminants via oxidation.

Goswami discloses a humidifier (Fig. 1(50)) on the gas inlet (18) to a photocatalytic/oxidation reactor (21) in order to provide the correct relative humidity for the complete oxidation and destruction of a microorganism in the photocatalytic/oxidation reactor (col. 7 line 60 – col. 8 line 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the humidifier and photocatalytic/oxidation reactor of Goswami with the fluidized bed oxidation reactor of Becker in order to ensure the correct humidity for the complete oxidation and destruction of said microorganisms.

*(Office Action of 3-23-07, pages 10 and 14).*

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks of Section 3 are incorporated herein by reference. As Goswami has merely been cited for disclosing a humidifier in communication with a gas inlet, nothing in Goswami rectifies the deficiencies in the combination of Becker and Zhou, as discussed above in Section 3 with respect to independent claim 1. Since dependent claims 6 and 14 incorporate all of the limitations of claim 1, they are likewise submitted to be nonobvious over the cited combination of references for at least the reasons discussed above.

Reconsideration and removal of the rejection is respectfully requested.



6. Rejection of claim 9 under 35 U.S.C. §103(a) as being unpatentable over Becker et al., US 2002/0006368, hereafter "Becker" or "368" in view of Zhou, US 6,500,969, hereafter "Zhou" or "969" as applied to claim 1 above, and further in view of Sherman, US 6,653,356, hereafter "Sherman" or "356."

Claim 9 stands rejected as obvious over the combination of Becker in view of Zhou and in further view of Sherman.

The outstanding office action acknowledges that Becker, as modified by Zhou, fails to expressly teach nanoparticles comprising a semi-conductive material. Sherman is relied upon to rectify this deficiency of Becker as modified by Zhou. In particular, the outstanding office action states:

Sherman discloses the production of photocatalytic nanoparticles and describes their uses therein, such as its anti-microbial (catalytic oxidation) properties.

Sherman teaches that a type of photocatalytic material to be used as nanoparticles is titanium dioxide (semi-conductive) in order to save costs and leverage anti-microbial effects in the presence of ultraviolet light (Abstract and col. 1 lines 28-38).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the photocatalytic nanoparticles comprising a semi-conductive material of Sherman in the fluidized bed oxidation reactor of the modified Becker in order to save costs and leverage anti-microbial effects in the presence of ultraviolet light.

*(Office Action of 3-23-07, page 11).*

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks of Section 3 are incorporated herein by reference. As Sherman has merely been cited for disclosing nanoparticles comprising a semi-conductive material, nothing in Sherman rectifies the deficiencies of Becker as modified by Zhou with respect to independent claim 1. Since claim 9 depends from claim 1, it necessarily incorporates all of the limitations of claim 1 and is likewise nonobvious with regard to the cited combination of Becker and Zhou.

Reconsideration and removal of the rejection is respectfully requested.

7. Rejection of claims 9 and 10 under 35 U.S.C. §103(a) as being unpatentable over Becker et al., US 2002/0006368, hereafter "Becker" or "368" in view of Zhou, US 6,500,969, hereafter "Zhou" or "969" as applied to claim 1 above, and further in view of Matsubara et al., US 5,993,624, hereafter "Matsubara" or "624."

Claims 9 and 10 stand rejected as obvious over the combination of Becker in view of Zhou and in further view of Matsubara.

The outstanding office action acknowledges that Becker, as modified by Zhou, fails to expressly teach nanoparticles comprising a semi-conductive material.

Matsubara is relied upon to rectify this deficiency of Becker as modified by Zhou. In particular, the outstanding office action states:

Matsubara teaches that a preferable catalyst contains a semiconductor, copper oxide (col. 3 lines 31-32 in order to decompose a contaminant (a carbonate) in a gas (col. 3 lines 24-30).

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the catalyst containing a copper oxide semiconductor of Matsubara to the nanoparticles in the fluidized oxidation reactor of Becker in order to decompose a contaminate (a carbonate).

*(Office Action of 3-23-07, pages 11-12).*

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks of Section 3 are incorporated herein by reference. As Matsubara has merely been cited for disclosing nanoparticles comprising a semi-conductive material, nothing in Matsubara rectifies the deficiencies of Becker as modified by Zhou with respect to independent claim 1. Since claims 9 and 10 depend from independent claim 1, they are likewise nonobvious over the cited combination of references for at least the reasons discussed above in Section 3.

Reconsideration and removal of the rejection is respectfully requested.

8. Rejection of claims 11 and 12 under 35 U.S.C. §103(a) as being unpatentable over Becker et al., US 2002/0006368, hereafter "Becker" or "368" in view of Zhou, US 6,500,969, hereafter "Zhou" or "969" as applied to claim 1 above, and further in view of Wu, US 2002/0187082, hereafter "Wu" or "082."

Claims 11 and 12 stand rejected as obvious over the combination of Becker in view of Zhou and in further view of Wu.

The outstanding office action acknowledges that Becker, as modified by Zhou, fail to expressly teach an ultraviolet light as well as the ultraviolet light within the hollow interior region of the chamber. Wu is relied upon to rectify the deficiencies of Becker as modified by Zhou. In particular, the outstanding office action states:

Wu teaches a photocatalytic/oxidation reactor (Fig. 3(a) (315)) which uses photocatalysts to treat polluted air.

Wu also teaches an ultraviolet light (320) in order to facilitate chemical reactions in photocatalysis (paragraph 8, lines 1-4). Wu further teaches said ultraviolet light being positioned within the hollow interior of the chamber (315). It is well known in the art that positioning the ultraviolet light inside the reactor or chamber maximize the exposure of the photocatalyst or the photoactive material, as is shown by Sanderson (US 2005/0079124, paragraph 113).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the internally positioned ultraviolet light of Wu with the fluidized bed oxidation reactor of the modified Becker in order to facilitate chemical reactions in photocatalysis and maximize the exposure of the photocatalyst.

*(Office Action of 3-23-07, pages 12-13).*

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks of Section 3 are incorporated herein by reference. As Wu has merely been cited for disclosing a fluidized bed reactor comprising an ultraviolet light, wherein the ultraviolet light is positioned within the hollow interior region of the chamber, nothing in Wu rectifies the deficiencies of Becker as modified by Zhou with respect to independent claim 1. Since claims 11 and 12 depend from independent claim 1, they are likewise nonobvious over the cited combination of reference for at least the reasons discussed above in Section 3.

Reconsideration and removal of the rejection is respectfully requested.

9. Rejection of claims 11 and 13 under 35 U.S.C. §103(a) as being unpatentable over Becker et al., US 2002/0006368, hereafter "Becker" or "368" in view of Zhou, US 6,500,969, hereafter "Zhou" or "969" as applied to claim 1 above, and further in view of Sato, US 6,812,470, hereafter "Sato" or "470."

Claims 11 and 13 stand rejected as obvious over the combination of Becker in view of Zhou and in further view of Sato.

The outstanding office action acknowledges that Becker, as modified by Zhou, fail to expressly teach an ultraviolet light positioned outside the chamber/reactor. Sato is relied upon to rectify the deficiencies of Becker as modified by Zhou. In particular, the outstanding office action states:

Sato teaches an ultraviolet light (80) positioned outside of the reactor chamber in order to facilitate preventing the ultraviolet light from overheating by using a fan blowing external air (col. 5 lines 18-24).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the external ultraviolet light of Sato with the photocatalytic/oxidation reactor of the modified Becker in order to facilitate prevention of the ultraviolet light overheating by using a fan blowing external air.

*(Office Action of 3-23-07, pages 13-14).*

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks of Section 3 are incorporated herein by reference. As Sato has merely been cited for disclosing a fluidized bed reactor comprising an ultraviolet light, wherein the ultraviolet light is positioned outside the chamber, nothing in Sato rectifies the deficiencies of Becker as modified by Zhou with respect to independent claim 1. Since claims 11 and 13 depend from independent claim 1, dependent claims 11 and 13 are likewise nonobvious over the cited combination of references for at least the reasons discussed in Section 3.

Reconsideration and removal of the rejection is respectfully requested.

10. Rejection of claim 15 under 35 U.S.C. §103(a) as being unpatentable over Becker et al., US 2002/0006368, hereafter "Becker" or "368" in view of Zhou, US 6,500,969, hereafter "Zhou" or "969" as applied to claim 11 above, and further in view of Sherman, US 6,653,356, hereafter "Sherman" or "356."

Claim 15 stands rejected as obvious over the combination of Becker in view of Zhou and in further view of Sherman.

The outstanding office action acknowledges that Becker, as modified by Zhou, fails to expressly disclose groups included in the photocatalytic material. Sherman is relied upon to rectify this deficiency of Becker as modified by Zhou. In particular, the outstanding office action states:

Sherman teaches the production of photocatalytic nanoparticles and describes uses therein, such as its anti-microbial (catalytic oxidation) properties. Sherman also teaches that a type of photocatalytic material to be used on nanoparticles is titanium dioxide (semi-conductive) in order to save costs and leverage anti-microbial effects in the presence of ultraviolet light (Abstract and paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the photocatalytic nanoparticles comprising a semi-conductive material of Sherman in the fluidized bed oxidation reactor of the modified Becker in order to save costs and leverage anti-microbial effects in the presence of ultraviolet light.

(Office Action of 3-23-07, page 15).

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks of Section 3 are incorporated herein by reference. As Sherman has merely been cited for disclosing groups included in the photocatalytic material, nothing in Sherman rectifies the deficiencies of Becker as modified by Zhou with respect to independent claim 1. Since claim 15 depends from claim 1 and incorporates all of the limitations therein, it is likewise nonobvious over the cited art for the reasons set forth in Section 3.

Reconsideration and removal of the rejection is respectfully requested.

11. Rejection of claims 16 and 17 under 35 U.S.C. §103(a) as being unpatentable over Becker et al., US 2002/0006368, hereafter "Becker" or "368" in view of Zhou, US 6,500,969, hereafter "Zhou" or "969" as applied to claim 11 above, and further in view of Wei, US 2005/0129591, hereafter "Wei" or "591."

Claims 16 and 17 stand rejected as obvious over the combination of Becker in view of Zhou and in further view of Wei.

The outstanding office action acknowledges that Becker, as modified by Zhou, fails to expressly teach nanoparticles comprising a metal oxide and a co-catalyst. Sherman is relied upon to rectify this deficiency of Becker as modified by Zhou. In particular, the outstanding office action states:

Wei teaches a nanoparticle photocatalyst that contains a metal oxide (titanium oxide) in order to destroy contaminants in an air purifier (paragraph 3 lines 1-2). Wei also teaches a co-catalyst (gold) in order to act together with the titanium oxide as an effective thermocatalyst for room temperature oxidation of carbon monoxide to carbon dioxide (paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use metal oxide photocatalyst and gold co-catalyst of Wei with the fluidized photocatalytic/oxidation reactor of Becker in order to destroy air contaminants and oxidize carbon monoxide to carbon dioxide at room temperature.

*(Office Action of 3-23-07, page 16).*

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks of Section 3 are incorporated herein by reference. As Wei has merely been cited for disclosing nanoparticles comprising a metal oxide and at least one co-catalyst, nothing in Wei rectifies the deficiencies of Becker as modified by Zhou and as noted above with respect to independent claim 1. Since claims 16 and 17 incorporate all of the limitations of claim 1, they are likewise nonobvious over the cited art for at least the reasons discussed above in Section 3.

Reconsideration and removal of the rejection is respectfully requested.

12. Rejection of claims 18-20 under 35 U.S.C. §103(a) as being unpatentable over Becker et al., US 2002/0006368, hereafter "Becker" or "368" in view of Zhou, US 6,500,969, hereafter "Zhou" or "969" as applied to claim 1 above, and further in view of Sigai, US 4,585,673, hereafter "Sigai" or "673."

Claims 18-20 stand rejected as obvious over the combination of Becker in view of Zhou and in further view of Sigai.

The outstanding office action acknowledges that Becker, as modified by Zhou, fails to expressly teach a means for agitating the catalyst nanoparticles in the hollow interior region. Sigai is relied upon to rectify the deficiencies of Becker as modified by Zhou. In particular, the outstanding office action states:

Sigai also discloses a fluidized bed chamber (Fig. 1 (15)).

Sigai teaches an agitation/vibrating/shaking system (Fig. 1 (17, 19)) in order to fluidize a suspended solid (in this case, phosphor powder) and improve the expansion of the fluidized bed (col. 4 lines 46-50).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the agitation/vibrating/shaking means of Sigai with the fluidized bed oxidation reactor of Becker in order to fluidize the suspended solid and improve the expansion of the fluidized bed.

*(Office Action of 3-23-07, pages 16 and 17).*

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks of Section 3 are incorporated herein by reference. As Sigai has merely been cited for disclosing an agitation/vibrating/shaking system in order to fluidize a suspended solid, nothing in Sigai rectifies the deficiencies of Becker as modified by Zhou and as discussed above with respect to independent claim 1. Since claims 18-20 depend from claim 1, they incorporate all of the limitations thereof and are likewise nonobvious for at least the reasons discussed above in Section 3.

Reconsideration and removal of the rejection is respectfully requested.

## CONCLUSION

Applicants respectfully submit that the Application and pending claims are patentable in view of the foregoing amendments and/or remarks. A Notice of Allowance is respectfully requested. As always, the Examiner is encouraged to contact the Undersigned by telephone if direct conversation would be helpful.

Respectfully Submitted,

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